(11) (A) No. 1 125 077

(45) ISSUED 820608

(52) CLASS 92-43

(51) INT. CL. ^{3}D21D 5/18

(19) (CA) **CANADIAN PATENT** (12)

(54) PROCEDURE AND APPARATUS FOR PREPARING GROUNDWOOD MECHANICALLY FROM WOOD CHIPS

(72) Valkama, Erkki;
Hyytiäinen, Pentti;
Tiainen, Kauko;
Skinnar, Rainer,
Finland

(73) Granted to Enso-Gutzeit Osakeyhtiö
Finland

(21) APPLICATION No. 347,930

(22) FILED 800319

(30) PRIORITY DATE Finland (793795) 791204

No. OF CLAIMS 7

ABSTRACT OF THE DISCLOSURE

A process for mechanically producing groundwood from wood chips, the wood chips being treated, after pre-heating under pressure in a steaming chamber, in two steps in disk grinders operating under pressure, these disk grinders having feeding means of enclosed construction. The groundwood coming from the first step disk grinder is conducted under the pressure of the steam generated in the blade interval of the grinder to the feeding means of the second step disk grinder. The transport of the groundwood is performed along a pipeline which is directly connected to the feeding means of the second step disk grinder. In said feeding means feeding problems arising from floating of the groundwood in the steam flow discharging from the second disk grinder against the groundwood flow is eliminated by feeding into the pipeline water or a chemical solution, which increases to the specific gravity of the groundwood.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. In a process for mechanically producing groundwood from wood chips, in which the wood chips, after pre-heating under pressure in a steaming chamber, are treated in first and second seqential steps in disk grinders under pressure, said disk grinders having feeding means of enclosed construction, the groundwood from disk grinder of the first step being conducted, under the pressure of the steam generated in the blade interval of the grinder of the first step to the feeding means of the disk grinder of the second step, the improvement in which the transport of the groundwood is effected along a pipeline which is directly connected to the feeding means of the disk grinder of the second step, into which pipeline water or a chemical solution, which increases the specific gravity of the groundwood is fed whereby any problems in the feeding means of the disk grinder of the second step due to floating of the groundwood in the steam flow discharging from the disk grinder of the second step against the groundwood flow is avoided.

2. A process according to claim 1, in which the addition of water of chemicals is made upstream of a push valve in the pipeline, by which valve the steam pressure in the disk grinder of the second step is regulated to be lower than the pressure prevailing in the disk grinder of the first step by the amount of flow resistance in the pipeline.

3. A process according to claim 1, in which the first step is effected by at least two disk grinders connected in parallel.

4. An apparatus for mechanically producing groundwood from wood chips comprising at least one first step disk grinder, a first feeding means for feeding pre-heated wood chips from a steam chamber to said at least one first step disk grinder;

said first feeding means being adapted to operate into the pressure prevailing in the steam chamber; a second step disk grinder, second feeding means for feeding groundwood for the at least one first step grinder to the second step grinder into the pressure of steam generated in the at least one first step disc grinder; said second feeding means being of a closed structure, the at least one first step disk grinder having an output connector connected by a pipeline with the second feeding means whereby the highest steam pressure is obtained in the second step disk grinder.

5. An apparatus according to claim 4, in which there are provided a plurality of first step disk grinders connected in parallel and connected by means of a common pipeline to the second step disk grinder.

6. An apparatus according to claim 4, in which in the pipeline between the first and second step grinders, immediately downstream the outlet connector, there is provided means for introducing water or a chemical solution, its quantity being regulated by means of a valve so that the grinding consistency in the second step disk grinder is between 20 and 30%.

7. An apparatus according to claim 4, 5 or 6, in which a pipeline is provided between the first and second step grinders which contains a push valve for regulation of the pressure on the input side of the second step disk grinder to be lower than the pressure prevailing in the first step disk grinder by the amount of the flow resistances in said pipeline.

The present invention relates to a method of producing, by mechanical means, groundwood from wood chips which are supplied into a pressurized steaming chamber, where the chips remain a few minutes and are there heated to about 120° Centigrade, whereupon the chips are conducted under the pressure of the steaming chamber into a disk grinder constituting step I of the defibrating process, and thence further under pressure into the step II disk grinder, where the defibrated product produced in step I is refined to the degree of beating required of paper pulp stock. The present invention also provides an apparatus for carrying out the method mentioned.

Nowadays, groundowod is produced, mechanically, mainly in three different ways namely mill grinding, grinding, and hot grinding. The pulp stock produced by the hot grinding procedure presents the best quality, this being due to the heating of the chips and their grinding under pressure, because it is then possible to defibrate the chips without any appreciable splintering of the fibres. An example of the above-mentioned hot grinding procudure is disclosed in U.S. Patent No. 4,072,274, in which the groundwood pre-ground under pressure in the step I disk grinder is conducted into a cyclone, where the groundwood and steam are separated. The groundwood is conducted from the lower part of the cyclone, through a lock feeder, to the disk grinder constituted step II of the procedure. The lock feeder enables the groundwood, separated from the steam in the cyclone, to be ground under pressure in the step II disk grinder.

The present invention carries out the step II grinding taking place under a pressure greater than atmospheric, in a way which is more advantageous and more reliable in service than any procedure of prior art, by employing, connected in series, disk grinders provided with the feed means disclosed in the U.S.

patent No. 4,219,166. In such case there is no longer any need of a steam separating cyclone between steps I and II of the defibrating procedure. These are replaced by the feeding means of the step II disk grinder, and this simplifies the apparatus that is used in the defibrating process.

According to the present invention there is provided in a process for mechanically producing groundwood from wood chips, in which the wood chips, after pre-heating under pressure in a steaming chamber, are treated in first and second sequential steps in disk grinders under pressure, said disk grinders having feeding means of enclosed construction, the groundwood from disk grinder of the first step being conducted, under the pressure of the steam generated in the blade interval of the grinder of the first step to the feeding means of the disk grinder of the second step, to the improvement in which the transport of the groundwood is effected along a pipeline which is directly connected to the feeding means of the disk grinder of the second step, into which pipeline water or a chemical solution, which increases the specific gravity of the groundwood is fed whereby any problems in the feeding means of the disk grinder of the second step due to floating of the groundwood in the steam flow discharging from the disk grinder of the second step against the groundwood flow is avoided.

The present invention also provides a process in which the addition of water or chemicals is made upstream of a push valve in the pipeline, by which valve the steam pressure in the disk grinder of the second step is regulated to be lower than the pressure prevailing in the disk grinder of the first step by the amount of flow resistance in the pipeline.

The present invention will be further illustrated by way of the accompanying drawings in which:

Fig. 1 is a schematic of an apparatus partly in section for effecting the process according to one embodiment of the present invention;

Fig. 2 is a projection viewed in the direction of line II-II in Fig. 1, and

Fig. 3 presents, in the form of a block diagram, another embodiment of the process of the present invention.

Referring to Fig. 1, wood chips are supplied from a storage hopper 1 for wood chips, by means of a controlled-speed lock feeder 3 into the steaming chamber 4, where a steam pressure of 300 to 250 kPa and temperature 120 to 140° Centigrade are maintained. The residual time of the chips in the steaming chamber 4 is 2 to 3 minutes, during which time the moisture content of the chips increases and the chips soften. From the steaming chamber 4, the chips are transferred by a screw 5, operating on the bottom of the chamber under the pressure prevailing in the chamber 4, to the feeding means 7 of the step I disk grinder 6 in the defibrating process. The feeding means 7 comprises a conically tapering feeding chamber 9, communicating with the feed apertures 8 of the disk grinder 6 and having on both sides (Fig. 2) a screw 11 directed obliquely downward and rotated by a motor 10, feeding the chips which fall down freely from the screw 5 into the feeding chamber 9, through the feeding aperture 8 at the level of the lower end of screw 11, into the gap between the disks of the grinder 6. As a result of the funnel shape of the feeding means 7, there remains a free space between the screws 11, into which the steam generated in the grinder's disk interval, discharges through the aperture 12 above the feeding apertures 8, without interfering with the feeding of chips, which is from both sides of the feeding chamber 9. The steam generated in the disk interval of the grinder 6 escapes through the connector 13

mounted in the cover of the feeding means 7 and into the pipe 15 provided with valve 14 and connected above this valve 14 by a branch pipe 16 with the steaming chamber 4. Moreover, the pipe 15 carries above the branch pipe 16, a valve 17. This valve 17 is kept open the while the apparatus is being run up to full operation, enabling fresh steam to be introduced in the steaming chamber 4 through this valve 17. During normal operation of the apparatus, the valve 17 is closed and steam enters the steaming chamber 4 through the valve 14 only. In the upper part of the steaming chamber 4 there is, furthermore, a pipe 18 connected to the heat recovery system of the installation, the valve 19 located therein being used to regulate the steam pressure prevailing in step I of the apparatus so, to be within the range from 300 to 250 kPa. The steaming chamber 4 furthermore has a connector 20, through which softening chemicals may be added , if necessary to the chips.

In the step I grinder 6 of the apparatus, the wood chips are defibrated into groundwood with a freeness within the range from 500 to 300 CSF (Canadian Standard Freeness), signifying that this stock still contains a high proportion of coarse fraction, or sticks. Under effect of the pressure in the disk grinder 6, the groundwood exits from the pipe connector 21 of the grinding chamber into the pipe 22, which is connected to the feeding means 24 of the disk grinder 23, likewise of enclosed design, constituting the step II of the apparatus, this feeding means being completely identical in its construction with the feeding means 7 of step I. The push pipe 22 contains the push valve 25 by which the pressure is regulated to be preferentially between 250 and 200 kPa. Furthermore, there is connected a pipe 26 to the push pipe 22, before the valve 25, through this pipe being supplied into the push pipe, controlled by the valve 27, either water or a chemical solution

for wetting the groundwood and increasing its specific gravity.

The amount of liquid added to the groundwood through the pipe 26 does not substantially reduce the consistency of the groundwood going to be ground in step II. This consistency is most properly between 20 and 30%. However, the addition of liquid has a fully decisive significance in the process of feeding the groundwood further to the step II disk grinder 23.

During normal running, high pressure steam is generated in the step II grinder 23, and part of which discharges in the manner already described, against the groundwood stream being conducted towards the grinder 23, in the feeding means 24. But since the groundwood has a specific weight lighter than the chips, it has a great tendency to float in the feeding means 24, with the result that an insufficient quantity of groundwood can be supplied into the blade gap of the disk grinder 23. The liquid addition conducted into the pipe 22, which is efficiently and uniformly absorbed by the groundwood, increases the specific gravity of the groundwood, whereby no such harmful floating can occur in the feeding means 24.

The feeding means 24 is fitted with similar feed screws 29, rotated by motors 28, as the feeding means 7, and its cover carries a pipe 30 for voiding the steam produced in the blade gap of the grinder. The pipe 30, fitted with a regulating valve 31, is connected to the installation's steam recovery system. With the aid of the valve 31 the pressure on the output side of step II is regulated, preferably to be lower than the pressure in step I just by the amount of flow resistances encountered in the push pipe 22, that is to be in the range from 250 to 200 kPa. Through the pipe 30 passes, to the installation's steam recovery system, a major part of the steam produced in the grinders 6 and 23, namely, the pushing steam escaping from grinder 6 and the steam generated in grinder 23

in its main part. In the disk grinder 23, the grinding of the groundwood to the final beating grade is accomplished, usually to within the range 60-120 CSF. The groundwood acceptable for paper pulp stock is withdrawn into the push pipe 32, the valve 33 in this pipe being used to adjust the pressure to be within 200-150 kPa.

Fig. 3 presents, schematically, another embodiment of the connecting of apparatus by the process of the invention. Here, the step I disk grinders 7 have been connected in parallel and the groundwood flows coming from them are combined, adding liquid in above-described manner, in one push pipe, which supplies the disk grinder 23 constituting step II. It is possible in this way to grind the output from two first steps with one step II grinder without need to use any lock feeder between the steps. This simplifies the equipment.

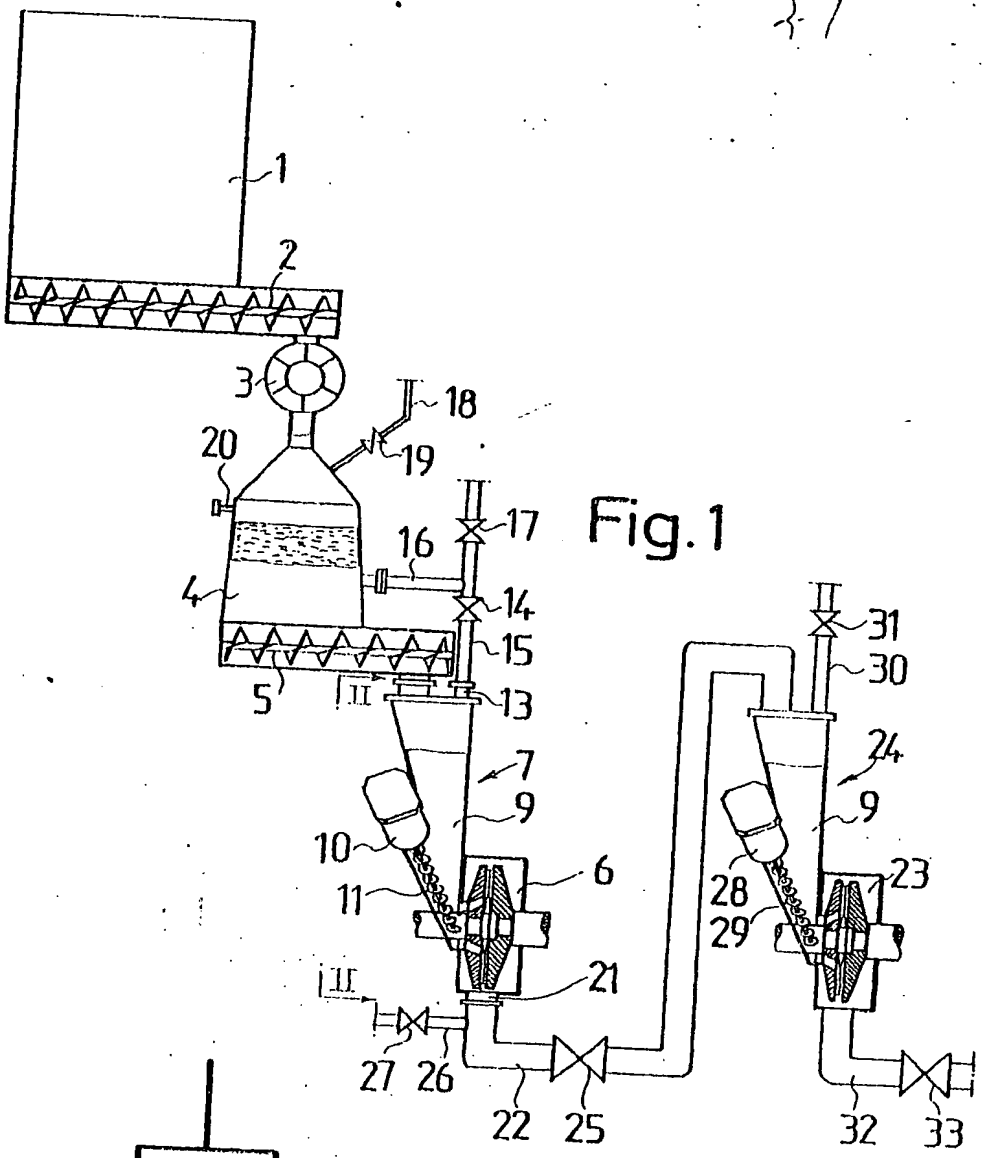
1
2
3
18
19
20
17
16
14
4
15
5
13
7
9
10
6
11
21
27
26
22
25
31
30
24
9
28
23
29
32
33

Fig. 1

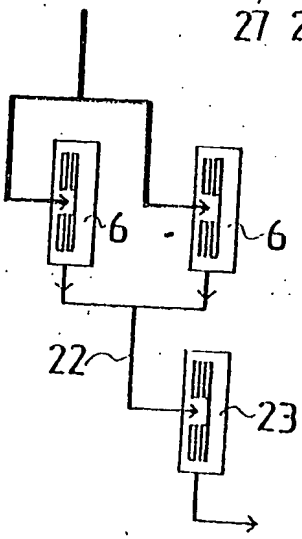
6
6
22
23

Fig. 3

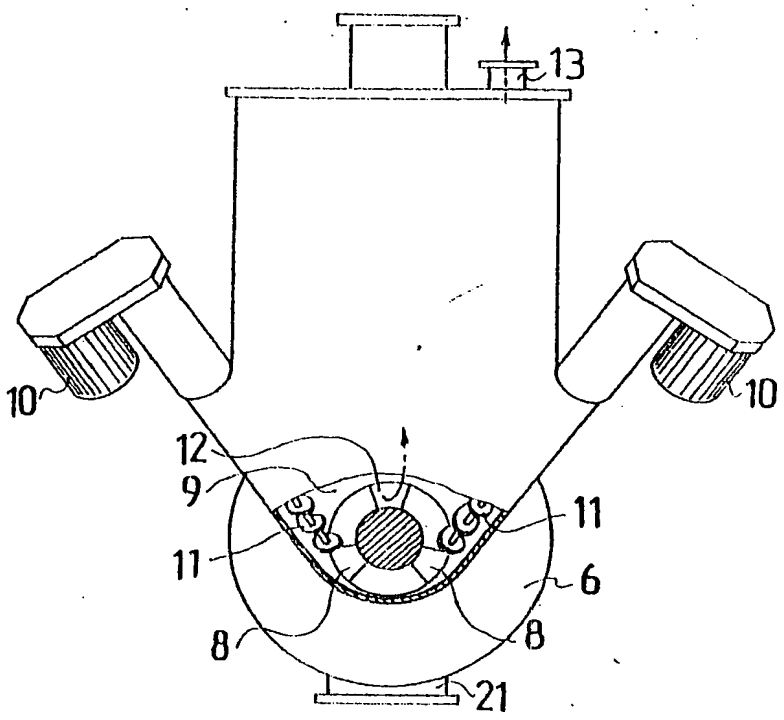

Fig. 2